

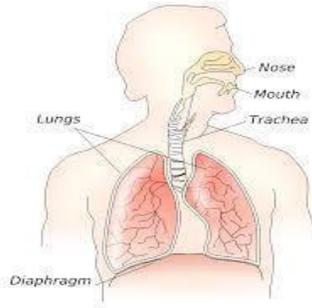
MY ORGANS T-SHIRT

Ages 11 to 14 (Level 3)

Description:	Learners will explore four different internal human body systems (respiratory, circulatory, digestive and urinary systems) by investigating their functions using simple models
Leading question:	How would your organs look on a t-shirt?
Age group:	11-14
Subjects:	Science, Art, Physical Education, Literacy
Total time required:	5 days - 1 hour 30 minutes a day
Self-guided / Supervised activity:	Medium supervision
Resources required:	Cardboard, pencil, colors, scissors, 4-6 small tubes, 4-6 empty plastic bottles, 4 small balloons and 2-3 big balloons, plain old T-shirt or big paper bag or any old cloth. Cotton, coffee filter papers (or paper towel or piece of cloth), small plastic funnel or the bottom part of a plastic water bottle. 1 jar of any size.

Day	Time	Activity and Description
1	10 minutes	<p>Learners will be able to identify the different parts of the respiratory system and how it works using a simple model and draw the relevant organs of the system</p> <p>Introduction:</p> <p>Ask learners some questions to review their knowledge of external body parts:</p> <ul style="list-style-type: none"> ● Which part of the body do you use to hold things? ● Which part of the body do you use to walk and run? ● Which part of the body helps you hear sounds? ● Which part of the body do you use to sense hot or cold objects? ● Which part of the body holds you up and allows you to walk upright? ● Which part of the body do you use to smell things? ● Which part of the body do you use to see things? <p>Extension: Label the diagram of the external body parts in the appendix</p>
	15 minutes	<p>Ask the learner:</p> <p>What happens when you inhale? What happens when you exhale?</p> <p>Learners will inhale and exhale placing their hand on their chest and one on their stomach and they will notice their chest and stomachs expanding and contracting</p> <p>Learners can measure their stomach using a tape or alternatively using a string.</p> <p>How much more string or tape will be required when you expand your stomach</p>

	<p>30 minutes</p>	<p>when breathing in? How many more finger spaces is required when you breathe in compared to when you breathe out?</p> <p>Ask learners to see how long they can hold their breath. What happens if we cannot breathe for a long time? Why does that happen?</p> <p>Learners can have a little competition with their peers or family members – they can try to say a long word in one breath e.g. Hiiiiiii... and count how many seconds they can say it without taking a breath. Now other family members can try the same and we can see who can do it for longer?</p> <p>Learners will learn more about the functions of the respiratory system by building a simple model using the instructions below:</p> <ul style="list-style-type: none"> - Cut open an empty plastic bottle at the bottom - Tie or tape two straws (or any two tubes made of any material) together from the middle and attach two small balloons to the bottom of each straw so that the balloons cover the bottom part of the straws - Insert the straws into the bottle from the bottom so that the opposite ends stick out from the mouth of the water bottle - Bring another balloon and cut off the bottom half and tie the top part - They will then use the open end of the balloon to cover the bottom half of the plastic bottle as shown in the image below - What part of the human body does this model look like? <p>Learner writes his/her observations on the respiratory system (learner uses one page for each system):</p> <ol style="list-style-type: none"> 1. What would happen if you pull the balloon on the bottom of the bottle? 2. What would happen if you push the balloon on the bottom of the bottle upward?  <p>Explain that the bottle represents your chest and the big balloon at the bottom represents an organ called the diaphragm. The two balloons inside the bottle represent your lungs and the two straws/pipes attached to balloons represent the airway passage called the bronchus. The main pipe/straw represents the trachea.</p>
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Based on the image above, how similar is the model you created to your respiratory system?

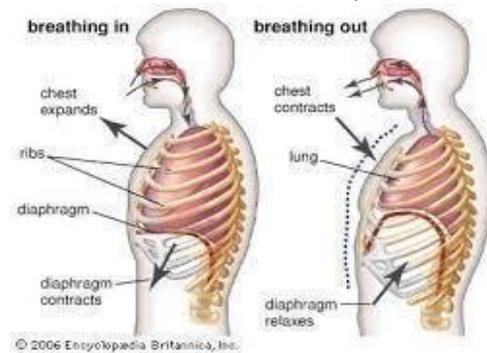
Where is the respiratory system located? Answer: it is in the chest area which is surrounded and protected by a cage of bones called **Ribs**

The learner will write a paragraph on the following topic: “how do we breathe?”, describing the functions of the respiratory system and its component parts

15
minutes

Explain that the act of **breathing** engages the diaphragm, a strong sheet of muscle that divides the chest from the abdomen. As you breathe in, the diaphragm drops downward, pulling **your lungs** with it and pressing against abdominal organs to make room for **your lungs** to expand as they fill with air.

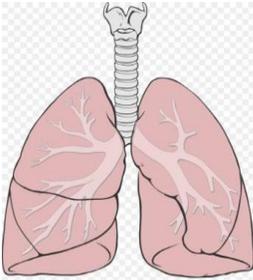
When you **inhale (breathe in)**, air enters your lungs and oxygen from the air moves from your lungs to your blood. At the same time, carbon dioxide, a waste gas, moves from your blood to the lungs and is exhaled (**breathed out**). This process is called gas exchange and is essential to life. This is why people die if they cannot breathe because this prevents oxygen from reaching the blood.



Learners will do an activity to understand the effect of movement and effort on breathing: learners race their friends/family members, covering a distance of 200 meters. They observe how running affects their breathing and the frequency at which they breathe.

20
minutes

Learners will count the number of breaths per minute for each family member before running and after running using a table to record the results:

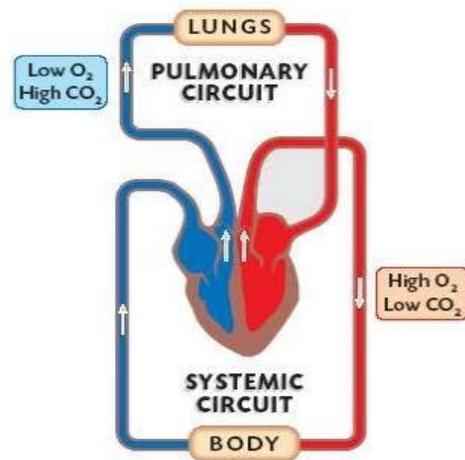
		Members	Number of breaths per minute before running	Number of breaths per minute after running		
		Member 1				
		Member 2				
		Member 3				
Learners will calculate: how much did number of breaths increase for each family member .Calculate the percentage of increasing the breadths after running						
		Members	Number of breaths per minute before running	Number of breaths per minute after running	The difference	The percentage of change
		Member 1	30	50	50-30=20	20/30x100=66.67 or 67%
Learners will write their observations about the observed change.						
Ask learners, why does the number of breaths increase? Explain that when you run/exercise and your muscles work harder, your body uses more oxygen and produces more carbon dioxide. To cope with this extra demand for oxygen, your breathing has to increase from about 15 times a minute (equivalent to 12 liters of air) when you are resting to about 40-60 times a minute (100 liters of air) during a run/ exercise.						
Learners will draw a diagram of the human respiratory system and use it to make their own internal systems T-shirt						
						
2		Today learners will be able to identify the parts of the circulatory system and the functions of each part using a simple model for the heart				

10 minutes	<p>Introduction:</p> <p>Ask learners: did you or any family member ever cut a finger accidentally? Describe what happened. Explain that:</p> <ol style="list-style-type: none"> 1. The cut will bleed and you will need to stop the bleeding. 2. Apply direct pressure on the cut or wound with a clean cloth, tissue, or piece of gauze until the bleeding stops. 3. Gently clean the cut and wound with soap and warm water. 4. Protect the wound. Apply antibiotic cream to reduce the risk of infection and cover with a sterile bandage. <p>Why do you need to apply direct pressure on the cut to stop it from bleeding? By the end of today we will discover why you need to apply pressure to a cut.</p>
20 minutes	<p>Learners will make a simple model of the human heart:</p> <ul style="list-style-type: none"> - Fill 3/4th of a jar with water and add red food coloring or paint. You can also use red colored juice (like cranberry juice) - Cut a balloon in half (or any piece of stretchy material) and use it to cover the jar - Make two holes in the balloon and insert a straw in each hole  <ul style="list-style-type: none"> - Learners will push down and pull up the balloon continuously. What do you notice? Write your observations. <p>Learners will discover that this jar and the balloon work like a pump - when they push down, the liquid will flow through the pipes or straws, the same way the heart acts as a pump that pumps blood to all parts of the body. The two straws represent the main blood vessels that carry blood away from and towards the heart. Arteries carry blood away from the heart and veins carry blood back to the heart.</p> <p>To answer our first question (why do you need to apply pressure to a cut), since our heart pumps blood and makes it flow fast all over the body, applying pressure slows down the pressure of the blood.</p> <p>Ask learners: Where is the heart located in your body?</p>

Answer: It is located between your lungs in the middle of your chest.

What are the main functions of the circulatory system?

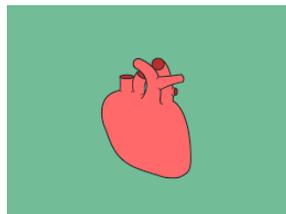
The circulatory system carries oxygen, nutrients, and hormones to cells, and removes waste products, like carbon dioxide. These roadways travel in one direction only, to keep things going where they should. See the diagram.



15
minutes

Drawing a heart

Describe the human heart or show learners the diagram below:



Learners will draw a heart on cardboard and cut it out (the size of the heart should be similar to the size of the learners' fist). Keep this drawing to make your organs T-shirt.

25
minutes

Learners do the following activity with friends/family members:

- Draw the table below. Players will check their pulses before they start the physical activities and record their initial pulse in the table
- Each player then does the first activity: jumping 5 times
- Players will record their pulse after activity 1 and do the second activity: running 50 meters or for 10 seconds
- Players will record their pulse after activity 2 and do the last activity: running 100 meters or for 40 seconds

		Number of pulses per minute before the start of activities	Number of pulses per minute after activity1	Number of pulses per minute after activity2	Number of pulses per minute after activity 3
		Player 1			
		Player 2			
		Player 3			
		<p>Ask learners: what did you notice? How did the activities affect the number of pulses? Why did they have that effect?</p> <p>Answer: During exercise, your body may need three or four times your normal cardiac output, because your muscles need more oxygen when you exert yourself. During exercise, your heart typically beats faster so that more blood gets out to your body.</p>			
3	15 minutes	<p>Today learners will be able to identify the main parts and the functions of the urinary system and draw it.</p> <p>Introduction: Ask learners the following before starting:</p> <ul style="list-style-type: none"> ● What did you learn in the last 2 days? ● What did you learn about the respiratory system and circulatory system? ● Which concept was most challenging? Why? ● What was your favorite part about the last two days? Why? <p>Ask learners: What types of wastes does your body get rid of? Why?</p> <p>Waste products such as carbon dioxide, urine, sweat, and solid waste, must be removed. If they are allowed to accumulate they will poison our bodies and slow down its vital chemical reactions.</p> <ul style="list-style-type: none"> ● How does your body get rid of Carbon dioxide? Which system gets rid of it? <ul style="list-style-type: none"> ○ The body gets rid of excess CO2 by breathing it out through the respiratory system. ● How does your body get rid of water? <ul style="list-style-type: none"> ○ Your body is constantly losing water through breathing, sweating, and urinating ● What are the main parts of the urinary system? <ul style="list-style-type: none"> ○ To answer this question let's do the following activity 			
	40 minutes	<p>Making a model of the urinary system</p> <p>Materials: 2 empty water bottles, clay, tubes(straws), coffee filters (or a piece of cloth, paper towel, or cotton balls), large piece of cardboard to mount model onto, tape, food coloring, small funnel or plastic container (see appendix).</p>			

Instructions:

- Cut off the bottom part of the empty water bottles. Use a pen or pencil to create a small hole in the cap.
- Snip approximately 12-16 inches of the tubes (2 pieces). Insert one end of the tube through the hole in the cap. Make sure the end of the tip is as far down and secure as possible to ensure that the water bottle drains as much as possible.
- Do the same for the other water bottle.
- Place 6-7 coffee filters or a piece of cloth in each water bottle and a couple of cotton balls.
- Using clear tape, affix the water bottles to a large sheet of cardboard or a box leaving approximately 5 inches between each bottle (leave room for the funnel and container underneath)
- Place the ends of tubing into a funnel to give you an idea of where to place funnel on cardboard. Use packing tape to secure the funnel in the appropriate spot. Secure the model to a wall/countertop. Place a plastic container underneath. See the image below
- You can reuse the bottom parts of the water bottles that were cut off to mix food coloring and water. Learners can gently pour “waste” into the “kidneys” and watch what comes out.



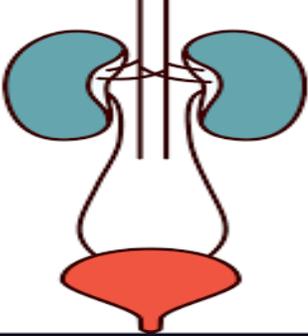
Learners will write their observations about the above experiment.

You can reuse the bottoms of the water bottles that were cut off to mix food coloring and water. Learners can gently pour “waste” into the kidneys and watch what comes out.

Explain that this model represents the **urinary system**:

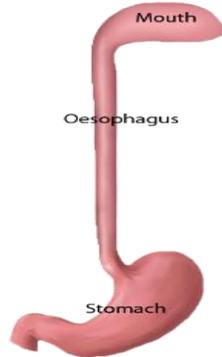
What is the function of this system? How does it work? The urinary system's function is to filter blood and create urine as a waste by-product. In our model:

1. The two bottles represent the **kidneys**
2. Each tube represents **ureter**
3. The funnel represents the **bladder**

	<p>15 minutes</p>	<p>From the above model, we know that the main parts of urinary system include the kidneys, ureters, and bladder.</p> <p>Learners will draw the urinary system on cardboard, cut it out then color it and keep it for the organs t-shirt</p> <p>Describe how to draw it or show learners the following diagram:</p>  <p>VectorStock® VectorStock.com/15168420</p>
<p>4</p>	<p>10 minutes</p> <p>10 minutes</p> <p>30 minutes</p>	<p>Today, Learners will be able to identify the parts and organs of the digestive system, the function of each organ, and draw the digestive system.</p> <p>Introduction Ask learners:</p> <ol style="list-style-type: none"> 1. Can you live without eating and drinking? Why? 2. What happens to the food you eat inside your body? 3. Which part of your body do you use to eat? <p>Let us do the following experiment to understand what happens to the food you eat inside your body:</p> <p>The journey of digestion</p> <p>Step 1: chewing food. The learner describes what happens if he/she is chewing food?</p> <ul style="list-style-type: none"> - The digestive process starts in the mouth when you chew, salivary glands will make saliva, a digestive juice, which moistens food so it moves more easily through a pipe called esophagus into stomach. The learner will bite a piece of bread and chew it, observing how saliva moistens it and makes it easier to swallow. What would happen if we did not produce saliva? The learner will write his or her observations <p>Step 2: food enters the stomach. Experiment to illustrate what happens to food in the stomach:</p> <p>Materials: balloon (or any piece of stretchy material), vegetable oil, white vinegar (or juice of two lemons), a piece of bread or handful of oatmeal. See appendix</p>

	25 minutes	<p>Instructions :</p> <ul style="list-style-type: none"> - Pour a few drops of the oil into the balloon and rub the balloon between your hands so the oil lines the inside of the balloon. Tip the balloon upside down so any extra oil will drop out. - Break some pieces of bread off and drop into the balloon, OR, drop about 15 oats into the balloon. - Pour about 1 tsp of the white vinegar into the balloon; you may need a bit more if you add more food. - Squish the balloon around for a minute or so. Then carefully start at the fattest part of the balloon and squeeze up. Ask learners to describe what comes out. <p>Learners will observe that the bread is dissolved. The stomach contains acid that helps break down the food you eat so your body can get the nutrients it needs from the food.</p> <p>Ask learners to draw the following table. They will repeat the same experiment with different food items and record their observations</p> <table border="1" data-bbox="430 898 1356 1144"> <thead> <tr> <th>Food</th> <th>Observation: Description before experiment</th> <th>Observation: Description after experiment</th> </tr> </thead> <tbody> <tr> <td>Small piece of potato</td> <td></td> <td></td> </tr> <tr> <td>Small piece of fruit</td> <td></td> <td></td> </tr> <tr> <td>Water</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Explain that after food enters stomach, the stomach muscles mix the food and liquid with digestive juices. The stomach slowly empties its contents, called chyme, into your small intestine.</p> <p>What happens to water in the stomach? Learners will observe that nothing happens to water. There is no need to break down water. It helps digestion because solid food needs water to be digested faster.</p> <p>Step 3: the small intestine absorbs most of the nutrients in Chyme.</p> <p>Step 4: the large intestine will absorb water, minerals then it will change the leftover into stool.</p> <p>Drawing the organs of digestive system</p> <p>Describe each organ or show a picture of the organ so that learners can draw each part on cardboard, cut it out and color it to use in their T-shirt design.</p> <p>Description of each organ and its location:</p>	Food	Observation: Description before experiment	Observation: Description after experiment	Small piece of potato			Small piece of fruit			Water					
Food	Observation: Description before experiment	Observation: Description after experiment															
Small piece of potato																	
Small piece of fruit																	
Water																	

1. **The esophagus** is the hollow tube that leads from the throat to the stomach.



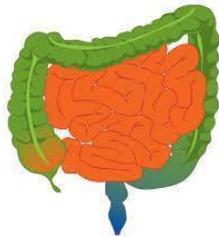
2. **The stomach** is a J-shaped, hollow organ located just below the diaphragm in the left part of the abdominal cavity.



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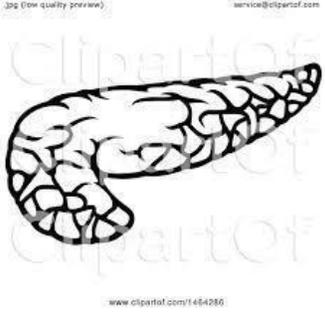
3. **The small intestine** is a long, narrow, folded or coiled tube extending from the stomach to the large intestine

4. **The large Intestine** has the shape of the letter “n” and surrounds the small intestine.



5. **The liver** is shaped like a cone. It is a dark reddish-brown organ located in the upper right-hand portion of the abdominal cavity, beneath the diaphragm



		<p>6. The pancreas is spongy, about six to ten inches long, and is shaped like a flat pear or a fish extended horizontally across the abdomen. The wide part, called the head of the pancreas, is positioned toward the center of the abdomen.</p> 
5	<p>20 minutes</p> <p>30 minutes</p>	<p>Today, Learners will design their organs T-Shirt and present it to family/friends</p> <p>Introduction Literacy extension: Ask learners to write a paragraph about each system, (or any two systems) describing their and their organs' functions, and their location.</p> <p>Design your internal organs t-shirt:</p> <ul style="list-style-type: none"> - Learners will collect all the diagrams they made and use them to design their t-shirt - Present the learner with the following two ideas for the design, but encourage them to be creative and use different ideas or different materials: <p>Idea 1</p> <ul style="list-style-type: none"> - Learners use a plain old t-shirt and glue the organs in order. 

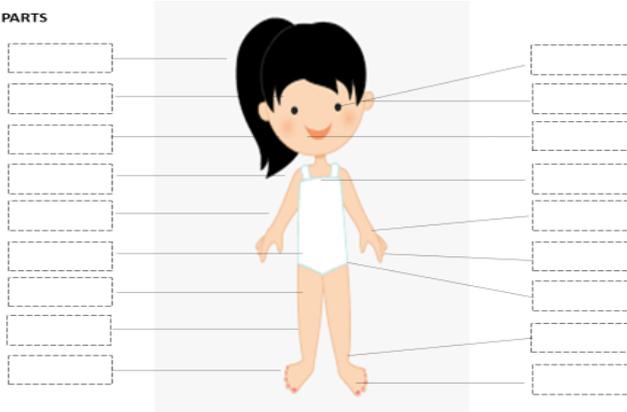
	<p>15 minutes</p>	<p>The organ diagrams must be glued in the following order:</p> <ol style="list-style-type: none"> 1. Esophagus 2. Two lungs and between them the heart 3. Stomach and on top of it the liver 4. The large intestine and inside of it the small intestine 5. The urinary system (kidneys and bladder) behind the large and small intestines <p>Learners will label and/or write on each organ one sentence or some words indicating its function. For example, on the stomach, learners can write “blends food”.</p> <p>Idea 2:</p> <ul style="list-style-type: none"> - Instead of old plain t-shirts, learners can use a big paper bag - Make a round hole at the bottom of the bag so that learners are able to “wear” it by inserting their head through the hole - Cut the sides of the bag so learners can insert their arms. - On the front side, learners will glue all the organs in the same order suggested above. <p>Idea 3:</p> <ul style="list-style-type: none"> - Make your own apron out of cloth or paper, and glue the organs on to the apron <div data-bbox="430 1150 1263 1682"> </div> <p>Learners present their t-shirt or apron to their family or friends, describing the functions of each organ and their location.</p>
<p>Assessment Criteria:</p>		<ul style="list-style-type: none"> -Learner identifies the name of interior organs and their functions accurately -Learner draws the internal organs accurately. -Creativity in designing Organs T-Shirt.

	-Grammatical and scientific accuracy in written Paragraph describing any two systems and their functions.
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Learning outcomes:	Learner will be able to: <ul style="list-style-type: none"> - Identify the internal organs and the function of the respiratory system. - Identify the internal organs and the function of the circulatory system. - Identify the internal organs and the function of the urinary system. - Identify the internal organs and the function of Digestive system. - Draw the main organs of digestive, respiratory, circulatory and urinary.
Required previous learning:	Identify the external body parts.
Inspiration:	https://www.pinterest.com/pin/157977899402928647/ All diagrams are from Pinterest website.
Additional enrichment activities:	For advanced learners , the internal organs and their functions can be described in more scientific detail (for example, discuss the four chambers of the heart and their functions)
Modifications for simplification	What can be done to make it simpler?

DAY 1

LABEL ALL THE BODY PARTS



Description of each part of respiratory system

- **Mouth and nose:** Openings that pull air from outside your body into your respiratory system.
- **Pharynx (throat):** Tube that delivers air from your mouth and nose to the trachea (windpipe).
- **Trachea:** Passage connecting your throat and lungs.
- **Bronchial tubes:** Tubes at the bottom of your windpipe that connect into each lung.
- **Lungs:** Two organs that remove oxygen from the air and pass it into your blood.
- **Diaphragm:** Muscle that helps your lungs pull in air and push it out

Additional information on the respiratory system:

Does the respiratory system have other functions?

- Allows you to talk and smell
- Brings air to body temperature and moisturizes it to the humidity level your body needs
- Protects your airways from harmful substances and irritants

DAY 3

Additional information on the urinary system:

Describe each part, its location, and the function of each organ:

1. The **kidneys** are two bean-shaped organs, each about the size of a fist, located just below the rib cage, one on each side of your spine. The kidneys are responsible for getting rid of waste products, drugs, and toxins through our urine (It acts as a filter)
2. The **ureters** carry the urine away from the **kidneys** to the urinary bladder, which is a temporary reservoir for the urine.
3. The **bladder** temporarily stores **urine** – it is a hollow organ with stretchable walls.

Sample materials needed to create urinary system model:



DAY 4

